Session Overview
Regulation of Safety Culture

Charles R. Martin
Defense Nuclear Facilities Safety Board Staff

The views expressed are solely those of the author and no official support or endorsement of this summary by the Defense Nuclear Facilities Safety Board is intended or should be inferred.

6/6/2005 ANS Presentation

Cleared for
Public Release
6/15/2005

Defining Safety Culture

- Lack of agreement on a practical definition; many exist
- Translating these definitions into concrete measures of behavior and performance that have a clear and direct bearing on safety and which are sufficiently objective to permit regulatory action is a daunting task.

The Rub

Unfortunately, translating these definitions into concrete measures of behavior and performance that have a clear and direct bearing on safety and which are sufficiently objective to permit regulatory action is a daunting task.

Significance of Cultural Attitudes.

- No matter how well safety systems have been designed and built, the lack of appropriate cultural behaviors can lead to the defeat or bypass of those engineered systems.
- Lack of appropriate attitudes and behaviors with respect to safety has been identified as an element in virtually all nuclear accidents to date.

- Positive attitudes toward safety must permeate all levels within an organization from management to operations (Management must clearly emphasize that safety must never be compromised in order to meet production goals).
- Informal practice must conform to formal policies.
- Workers must feel personally accountable for safety.

Key Studies and References

- 75-INSAG-3, 1988
- 75-INSAG-4, 1991
- DNFSB/TECH-15, *Operational Formality for DOE Nuclear Facilities and Activities*, 1997
- Recent NRC Regulatory Information Conferences
- IAEA TECDOC-1321, *Self-Assessment of Safety Culture in Nuclear Installations: Highlights and Good Practices*, 2002
- INPO, *Principles for a Strong Nuclear Safety Cultue, 2003*
- *Nuclear Industry Evaluation Program*, 2003

Promoting Positive Behaviors

- One of the first responsibilities of management is to clearly establish an environment in which safety is uppermost in the minds of all employees.

- Management must, through it's policies and behavior, set a good example.

Evaluating Attitudes and Behaviors

- Lack of commonly accepted terminology and objective performance measures makes direct regulation of culture difficult.
- It can certainly be used as a leading indicator of potential accident conditions.
- It can also be used as both a carrot and a stick to achieve safety goals: as a tool to tailor the number of and depth of safety reviews or to control delegation of certain kinds of approvals.
- Oversight by line management and independent organizations can evaluate the quality of the work practices and procedures, as well as the symptoms of cultural problems.

Evaluating Attitudes and Behaviors (cont.)

- Periodic assessments of the culture at a facility may include (1) reviews of trends in incident and occurrence reports, (2) reviews of the effectiveness of programs to identify, correct, and prevent problems, (3) reviews of maintenance backlogs, (4) walkdowns of day-to-day activities, and (5) reviews of corrective action programs.
- Many consider the state of the facility level corrective action program as the most objective evidence of the status of the culture at a facility.
- Means: interviews, surveys, observing work practices, and reviews of documentation (things that are generally already done in the course of reviewing specific functional areas of nuclear safety).

Improving Attitudes and Behaviors

- Change takes time and must be driven by a top-level management commitment. Management would be well advised to periodically assess the overall culture and trend the results in as objective a manner as possible. Management should also promote a work environment in which workers are encouraged to raise safety concerns. And, finally, management needs to set high standards for performance through an emphasis on quality, accountability, and aggressive handling of corrective actions.

Recent Board Public Meetings Explored High Consequence Accident Prevention

- **Normal accident theory**
  - The unexpected will defeat the best safety systems
  - System complexity and tight coupling cause system failures
- **High reliability organizational attributes**
  - Extraordinary technical competence,
  - Flexible decision making,
  - Reward the discovery of errors, and
  - Equal value is placed on production and safety.
- **Performance measures**
  - Correction of small problems will prevent the big problems
- **CAIB**
  - Past successes may be the first step toward future failure
  - Organizations become desensitized to deviations from standards
  - Leaders must demand minority opinions and healthy pessimism
  - Safety efforts must focus on preventing instead of solving mishaps
- **Davis-Besse Reactor Vessel Head Degradation – Lessons Learned Task Force**
  - Technical causes – leaking boric acid
  - Organizational causes – poor self assessment, production over safety, and poor NRC oversight

Board Concerns Leading to Rec 2004-1

1. DOE encourages efficiency via performance-based contracts - could result in contractors putting production goals ahead of safety - cultural issue.
2. DOE has removed impediments by streamlining requirements - could eliminate necessary safety requirements.
3. DOE has decentralized Federal oversight responsibilities to field - cultural issues:
   - could compromise DOE's central role of self-regulation of nuclear safety,
   - will likely delay actions to correct complex-wide safety issues,
   - site offices may not have adequate technical capabilities.

Objective of Recommendation 2004-1: Ensure that organizational changes do not increase the likelihood of a low-probability, high-consequence nuclear accident

Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*

1. Ensure that:
   a) **oversight responsibility** includes the capability for examining, assessing, and auditing by all levels of the DOE organizations;
   b) the **technical capability** and appropriate experience for effective safety oversight is in place;
   c) **corrective action plans** consistent with recommendations resulting from internal DOE and NNSA reviews of the Columbia accident and the Davis-Besse incident are issued.
2. Take steps to:
   a) empower a **central and technically competent authority** responsible for operational and nuclear safety goals, expectations, requirements, standards, directives, and waivers;
   b) ensure the continued integration and support of **research, analysis, and testing in nuclear safety technologies**;
   c) require that the principles of **Integrated Safety Management** serve as the foundation of the implementing mechanisms at the sites.

Backup Charts

Panelists

- Dr. Constance Perin, Visiting Scholar Program in Science, Technology, & Society, Massachusetts Institute of Technology E51-185
- Dr. William R. Corcoran, Nuclear Safety Review Concepts
- Ms. Isabelle Schoenfeld, Office of Enforcement, U.S. Nuclear Regulatory Commission
- Mr. Chip Lagdon, Director, Quality Assurance Programs, US Department of Energy
- Dr. Sonja B. Haber, Human Performance Analysis, Corp.

Formal safety systems

- **Regulatory compliance**
  - Robust safety standards, independent oversight, and redundancy are essential for nuclear safety
- **Formality of operations**
  - Rigorous adherence to formal procedures can control accidents,
- **Integrated Safety Management**
  - Basically a common-sense, systems engineering approach to doing work safely

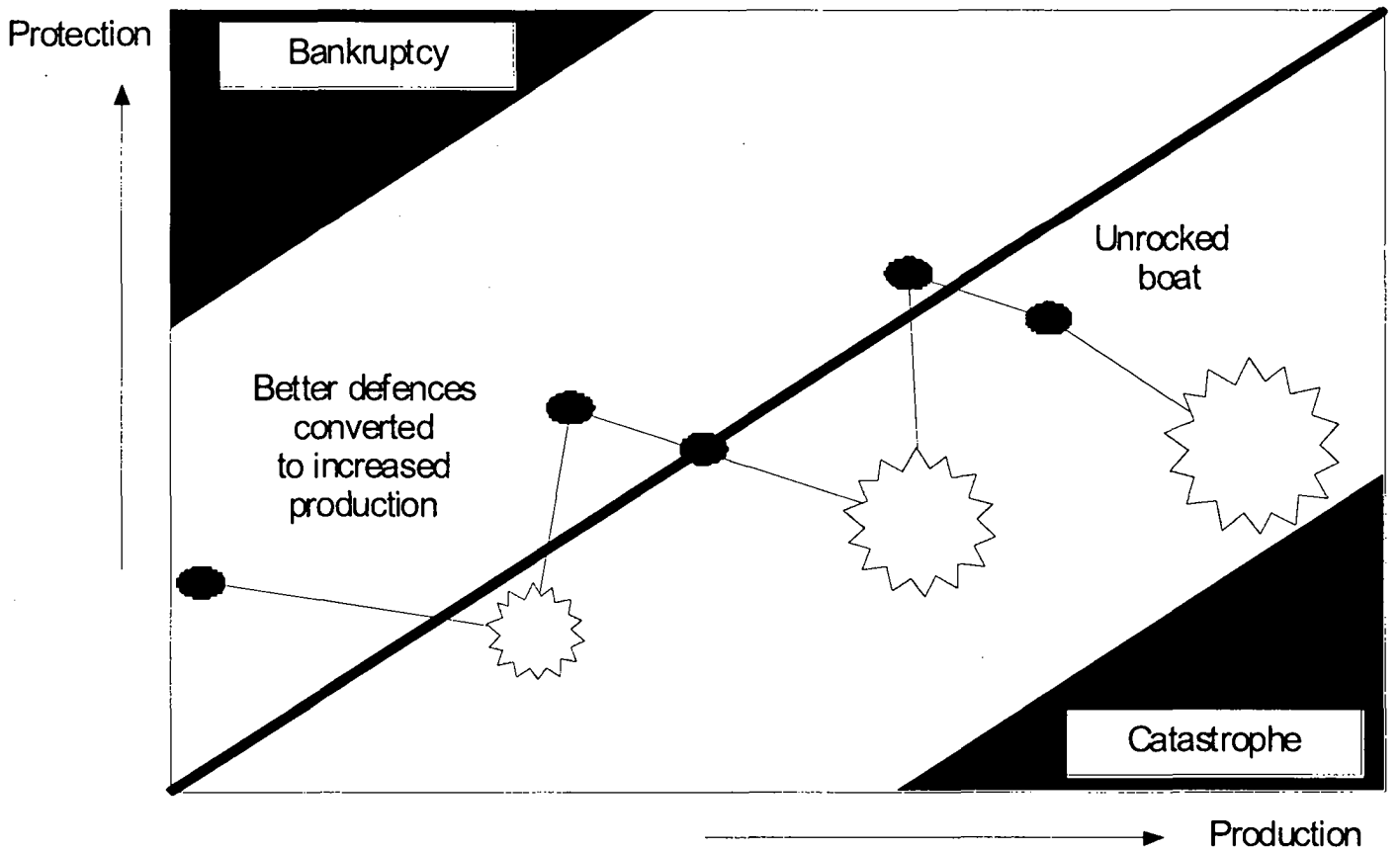
Central Technical Authority,
key roles, responsibilities, and authorities

- Develop and concur on nuclear safety research topics.
- Concur with proposed nuclear safety rules and directives.
- Assess nuclear safety delegations, ensuring that site offices have the capability and capacity to execute these delegations.
- Monitor overall safety management, particularly for high-hazard activities.
- Participate in nuclear safety design reviews, Documented Safety Analysis reviews, readiness reviews, and other nuclear safety review activities.
- Approve waivers and exemptions to nuclear directives.
- Concur with Authorization Agreements.

Central Technical Authority,
important activities

- Centralized safety versus mission decisions,
- Action-forcing authority for nuclear safety issues,
- Integration of lesson learned across complex,
- Unfettered access to maintain operational awareness,
- Central startup approval of high-consequence nuclear operations,
- Access to Facility Representatives and other safety experts,
- Uniformity in safety management practices,
- Oversight of Integrated Safety Management functions, and
- Resolution of differing professional opinions.

Organizational Drift



James Reason, *Managing the Risks of Organizational Accidents*

Nuclear Safety Core Capability

- A strong science and engineering foundation in nuclear safety technologies is a necessary component for safe operation of nuclear facilities.
- Without a solid nuclear safety competency, current and future missions in nuclear technologies for national and energy security could be at risk.
- DOE needs to establish a sustainable capability that will maintain and advance the scientific and engineering understanding of nuclear safety.

Office of Nuclear Safety Research,
important goals

- Maintain nuclear safety core capability for DOE,
- Advance the fundamental understanding of nuclear safety science and technology,
- Coordinate nuclear safety research across DOE and NNSA,
- Advance the information needed to develop technical directives,
- Develop technically competent safety professionals,
- Provide generic support for:
  - nuclear weapons activities,
  - nuclear energy programs,
  - nuclear materials activities, and
  - nuclear waste programs.

Office of Nuclear Safety Research,
key roles, responsibilities, and authorities

- Evaluate and prioritize nuclear safety research needs,
- Allocate resources,
- Manage research programs,
- Assess the effectiveness of regulatory programs,
- Develop technical basis for nuclear directives,
- Maintain nuclear safety testing and analysis capabilities,
- Integrate results in the areas of:
  - nuclear facility design and construction,
  - safety analysis,
  - safe nuclear operations, and
  - development of technically sound safety directives.